



Four JSC volunteers spend 30 days in a test chamber recycling air, water. Story on Page 3.



The Hubble Space Telescope captures images of distant galaxies thought to be the oldest in universe. Story on Page 4.

Space News Roundup

Vol. 35

July 5, 1996

No. 26

NASA selects Lockheed Martin to build X-33

Half scale model of reusable launch vehicle 'VentureStar' to fly in 1999

Vice President Al Gore announced Tuesday that Lockheed Martin has been selected to build the X-33 test vehicle.

A one-half scale model of the Reusable Launch Vehicle will be used to demonstrate advanced technologies that will dramatically increase reliability and lower the costs of putting payloads into space.

Lockheed Martin will design, build and conduct the first test flight of the X-33 test vehicle by March 1999, and conduct at least fifteen flights by December 1999. NASA has budgeted \$941 million for the project through 1999.

Lockheed Martin will invest \$220 million in its X-33 design.

Called "VentureStar," the Lockheed Martin design is based on a lifting body shape with a radical new aerospike engine and a rugged metallic thermal protection system which would be launched vertically like a rocket and land horizontally like an airplane.

"The RLV program is a radical departure from the way NASA has done business in the past," NASA Administrator Daniel S. Goldin said. "Our role is to develop the high risk technologies that industry cannot afford. But we

won't build the vehicle, industry will. NASA will be a user, not an operator."

Goldin said the objective of the RLV technology program is simple. "We want to develop technologies that will allow industry to build a vehicle that takes days, not months, to turn-around; dozens, not thousands of people to operate; reliability ten times better than anything flying today; and launch costs that are a tenth of what they are now. Our goal is a reusable launch vehicle that will cut the cost of a pound of payload to orbit from \$10,000 to \$1,000."

"The X-33 will be about half the size of a full-scale RLV. It will be a remotely-piloted, sub-orbital vehicle, capable of altitudes up to 50 miles and speeds of Mach 15," said RLV Director Gary Payton.

"The X-33 test vehicle is the most advanced part of a three-pronged RLV program to develop and demonstrate the kinds of technologies required by industry to build a new launch system that will provide truly affordable and reliable access to space," Payton said. "The RLV approach is to design a little, build a little, test a little, fly a little."

Sega leaves JSC to teach

Astronaut Ron Sega left NASA to rejoin the faculty at the University of Colorado at Colorado Springs.

Sega had been on an extended leave from the university and returns as dean of Engineering and Applied Science.

"We are sorry to see Ron leave," said David Leestma, director of Flight Crew Operations. "His knowledge, hard work and dedication will be missed."

Sega was selected as an astronaut in 1990, making his first shuttle flight in 1994 aboard *Discovery*, the first joint U.S./Russian shuttle mission.

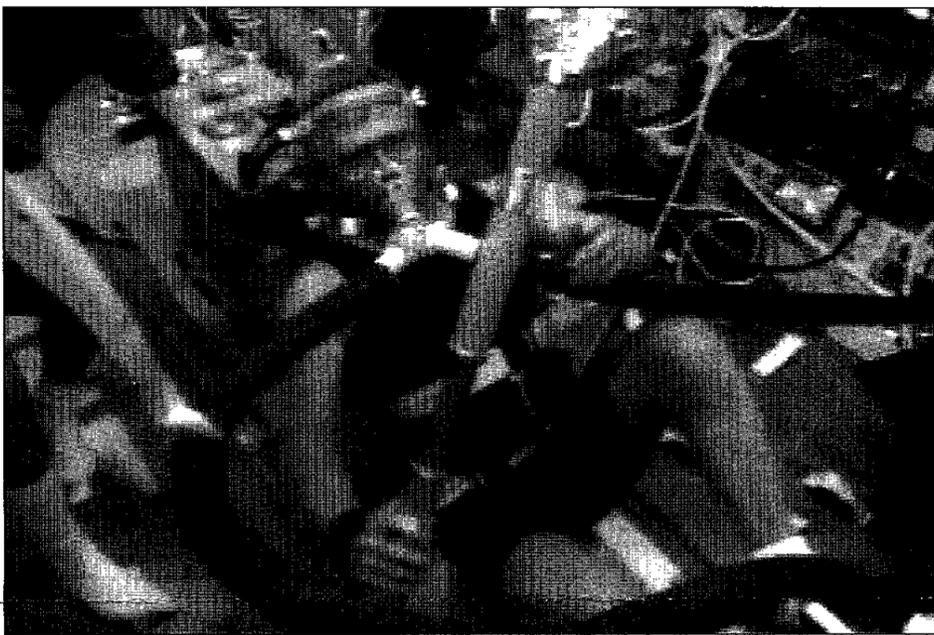
STS-60 was the second flight of the Spacehab-2, and the first of the Wake Shield Facility.

From November 1994 to March 1995, Sega served as Director of Operations, Russia, responsible for managing NASA activities supporting astronaut and cosmonaut training for flight on the Russian Mir Space Station. He also participated in training on Russian Space Systems and was the first American to train in the Russian Orlan suit in their underwater facility.

His second shuttle flight was in 1996 as payload commander for the third docking mission to Mir. Following rendezvous and docking, Sega and his crewmates delivered Cosmonaut Researcher Shannon Lucid to Mir to begin a two-year continuous presence of U.S. astronauts on the Russian outpost.



Ron Sega



STS-78 Mission Specialist Chuck Brady holds an unlit Olympic Torch while exercising on the bicycle ergometer in the Spacelab. He was joined by his crewmates—Commander Tom Henricks, Pilot Kevin Kregel, Mission Specialists Susan Helms and Rich Linnehan and Payload Specialists Jean-Jacques Favier and Bob Thirsk—on board *Columbia* in an informal salute to the 1996 Olympics which open July 19 in Atlanta. *Columbia* is expected to set a record for the longest shuttle flight when it lands at 7:38 a.m. JSC time Sunday.

Mir crew praises STS-78 work

By Natasha Calder

American Cosmonaut Researcher Shannon Lucid and her Russian Mir crewmates talked with the Space Shuttle *Columbia* astronauts this week to congratulate them on their ongoing mission.

Lucid and her Mir crewmates — Commander Yuri Onufrienko and Flight Engineer Yuri Usachev — expressed regrets Wednesday that the two crews would not have a chance to work together.

"We welcome our neighbors in space," Onufrienko said. "We would like to wish you successful completion of the experiments which study the effects of weightlessness on human beings."

STS-78 Commander Tom Henricks voiced his appreciation for the success of the Mir 21's crew space walks. "We wish to congratulate you on your continued success during this long duration mission," he said.

Lucid reflected on the international flavor of the crews currently in low-Earth orbit. "It's really great to talk to you Tom and hearing all about your crew. We really have an international group up here. It's to bad we can't get a little closer and talk a little longer," she said.

Lucid also was involved in an online conference with students from the Manhattan School for Children in New York City last week. During this first ever online interview hosted by NASA,

Please see **STUDENTS**, Page 4

Columbia to land Sunday, record in hand

By Karen Schmidt

The STS-78 astronauts are scheduled to return to Earth on Sunday with a record for the longest space shuttle flight in history.

Commander Tom Henricks, Pilot Kevin Kregel, Mission Specialists Susan Helms, Rich Linnehan and Chuck Brady and Payload Specialists Jean-Jacques Favier and Bob Thirsk received word Saturday that mission managers extended their mission to 17 days.

"*Columbia*, Houston," said Spacecraft Communicator Chris Hadfield. "Your mission, and we know you'll be glad to accept it, is to extend to 17 days on orbit. Congratulations."

Columbia will break the previous record held by *Endeavour* on STS-67, which flew in March 1995. That flight lasted 16 days, 15 hours. STS-78 is expected to last 16 days, 21 hours. The record will be broken in the early morning hours Sunday as the crew prepares for reentry. *Columbia* is expected to return to Kennedy Space Center's Shuttle Landing Facility at 7:38 a.m. CDT Sunday with the crew arriving at Ellington Field later in the afternoon.

"The experiments and orbiter systems keep everything mentally challenging and the days literally fly by," Henricks said.

Wednesday, the STS-78 crew achieved a radio link with the Mir 21 crew—Commander Yuri Onufrienko, Flight Engineer Yuri Usachev and Cosmonaut Researcher Shannon Lucid—to discuss its work in low-Earth orbit.

"This is an international event, having spacecraft from two nations both flying foreign visitors in a peaceful endeavor for research in space," Henricks said. "Another peaceful endeavor which should make

Please see **CREW**, Page 4



Atlantis work on target for fourth docking flight

The fourth Phase 1 docking mission and the first shuttle retrieval of an American from the Russian Mir Space Station are on schedule for a July 31 launch following this week's routine hot-fire of a replacement auxiliary power unit on *Atlantis*.

Commander Bill Readdy and a crew of six is set to lift off at 10:29 a.m. CDT July 31 from Kennedy Space Center's Launch Pad 39A. The launch window is 7 to 10 minutes long.

The crew—except for Mission Specialist John Blaha—will spend 8 days, 20 hours and 35 minutes in orbit, and land about 7:05 p.m. Aug. 9 at KSC. On arrival at Mir, Blaha will begin a stay of four months as a cosmonaut researcher. He will

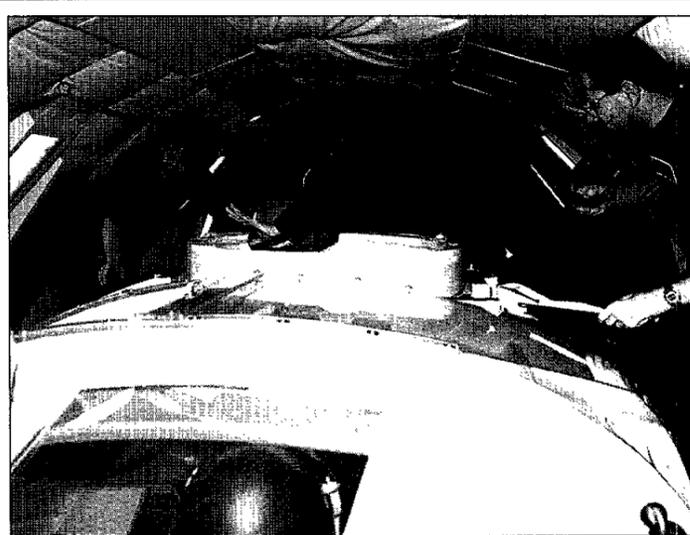
replace astronaut Shannon Lucid, who has been part of the Mir 21 crew since March. Lucid, by then the American long-duration space flight record holder, will return to Earth with the STS-79 crew.

Mir 22 Commander Gennady Manakov, Flight Engineer Pavel Vinogradov and French Cosmonaut Researcher Claudie Andre-Deschays are scheduled to join Blaha aboard Mir on Aug. 16

to begin what is expected to be a six-month mission.

Work this week at KSC included launch pad validations and a main engine flight readiness test. The helium signature leak check for the main engines is scheduled for

Please see **DISCOVERY**, Page 4



JSC Photo by Robert Markowitz

X-CRV—The Experimental Crew Return Vehicle Office, in cooperation with the Astronaut Office and the Flight Surgeon's office, conduct a variety of tests on an experimental crew return vehicle during zero-g parabolas in the KC135. From left are Deputy Project Manager Merri Sanchez, Astronaut Kalpana Chawla and Project Manager John Muratore. Tests included ingress, egress, reach and visibility of medical equipment, seats and hatches.

JSC videos win Telly awards

JSC garnered accolades for excellence in video productions at the 1996 Telly Awards.

Taft Broadcasting Co. and Media Services Corp. received four awards in the national competition that recognizes excellence in non-network television, cable, film and video productions. The total number of entries was more than 9,000, including The Disney Channel, Coca-Cola, Nike, National Geographic and others.

In the education category, the winner was Taft's "Microgravity." This educational program, hosted by astronaut Jan Davis, explains to students what microgravity is, how it is achieved and why it is such an ideal setting for many types of scientific research. The program is a part of the Lift-Off To Learning educational series which is created by the JSC Education Working Group for national distribution to teachers and students.

Please see **JSC**, Page 4

JSC

Ticket Window

The following discount tickets are available for purchase in the Bldg. 11 Exchange Store from 10 a.m.-2 p.m. Monday-Thursday and 9 a.m.-3 p.m. Friday. For more information, call x35350 or x30990.

Lovin Feelings Concert: 7 p.m. Sept. 28 at the Summit. Tickets cost \$37.
Arena Football: Texas Terror vs Florida 7:30 p.m. July 13 at the Summit. Tickets cost \$11.50.

EAA Caribbean Getaway from New Orleans: Carnival Cruise Sept. 13-20, from \$539, \$200 deposit required, final payment due July 8.

EAA Mexico Copper Canyon Train Trip: Nov. 6-12, \$995 per person, \$200 deposit required, final payment due Sept. 6.

Splashtown: One day pass cost \$14.25.

Schlitterbahn: One day pass cost \$19.75 for adults, \$16.95 for children.

Astroworld: One day pass cost \$22.75, two day pass cost \$34.25.

Fiesta Texas: One day pass cost \$22.75, two day pass cost \$34.25.

Six Flags at Arlington: One day pass cost \$22.75, two day pass cost \$34.25.

Sea World: Adult tickets cost \$24.50, children (3-11) cost \$17.25.

Space Center Houston: Discount tickets, adult, \$8.75; children (4-11), \$7.10.

Movie discounts: General Cinema, \$4.75; AMC, \$4.50; Sony Loew's, \$4.75.

Stamps: Book of 20, \$6.40.

JSC history: *Suddenly, Tomorrow Came: A History of the Johnson Space Center.* Cost is \$11.

Metro tickets: Passes, books and single tickets available.

Upcoming events: Ringling Brothers Circus: 11:30 a.m. July 27 at the Summit. Tickets cost \$12.

JSC

Gilruth Center News

Sign up policy: All classes and athletic activities are first come, first served. Sign up in person at the Gilruth Center and show a NASA badge or yellow EAA dependent badge. Classes tend to fill up two weeks in advance. Payment must be made in full, in exact change or by check, at the time of registration. No registration will be taken by telephone. For more information, call x30304.

EAA badges: Dependents and spouses may apply for photo identification badges from 7 a.m.-9 p.m. Monday-Friday; and 8 a.m.-4 p.m. Saturdays. Dependents must be between 16 and 23 years old.

Golf instruction: Group Golf Clinics throughout spring and summer at Clear Lake Golf Club. Sign up at Gilruth.

Fitness Challenge: 1996 Fitness Challenge runs to Aug. 31. Employees are eligible to win \$100 gift certificates. For more information call Larry Wier at x30301.

Defensive driving: One day course is offered once a month. Cost is \$25. Interested employees should call the Gilruth.

Stamp club: Meets at 7 p.m. every 2nd and 4th Monday in Rm. 216.

Women's self defense: Martial Arts training for women only from 5-6 p.m. Tuesdays and Wednesdays. Cost is \$25 a month.

Weight safety: Required course for employees wishing to use the weight room is offered from 8-9:30 p.m. July 11. Pre-registration is required. Cost is \$5.

Exercise: Low-impact class meets from 5:15-6:15 p.m. Mondays and Wednesdays.

Aikido: Martial arts class meets from 6:15-7:15 p.m. Tuesday and Wednesday. Cost is \$25 per month. New classes begin first of each month.

Aerobics: Class meets from 5:15-6:15 p.m. Monday, Tuesday and Thursday. Ballroom dancing: Cost is \$60 per couple. For additional information call the Gilruth Center at x33345.

Country and Western dancing: Beginner class meets 7-8:30 p.m. Monday. Advance class meets 8:30-10 p.m. Monday. Cost is \$20 per couple.

Fitness program: Health Related Fitness Program includes a medical examination screening and a 12-week individually prescribed exercise program. For more information, call Larry Wier at x30301.

JSC

Swap Shop

Property

Sale: Clear Lake condo, 1-1, W/D, FPL, good cond, close to NASA, Ruben, x47119 or 486-0817.

Sale: League City, Brittany Bay, 4-2.5-3D, tile, sec system, workshop, CC school district, \$121k appraised. Carlos, x38879 or 332-1991.

Sale: Wooded lot 90' x 135' in Taylor Lake Estates, near JSC, \$39.5k can finance. Don, x38039 or 333-1751.

Rent: League City, Pecan Forest, 3-2-2, FPL, very clean, no pets, \$850 mo. 554-6200.

Sale: Heritage Park, 3-2-2, brick 2-story, owner, below appraised value, high \$70ks. 482-8845.

Sale/Lease: League City, Bayridge subdivision, 3-2-2, cul-de-sac, new roof, \$55k obo. James, 286-1934.

Rent: University Trace, 2-2, refridge, W/D conn, covered parking, \$550/mo. 480-1340.

Sale: Brook Forest, 4-2-2, 2300 sq ft, FPL, new carpet/paint/tile/fence/A/C/H, \$129.9k nego. Brian, x32635 or 480-4351.

Sale: Egret Bay condo, 1-1, W/D, FPL, new carpet cov'd parking, available 7/16, \$29.9k. 339-2306.

Sale: League City, Countryside Oaks, 3-2.5-2A, 1.5 story, 1/4 acre, formals, FPL, built-ins, wet bar, BDR's upstairs, deck off 2nd floor MSTR, new paint/wallpaper, lots of trees, \$84.7k. Marty, x40268 or 332-9783.

Rent: University Trace condo, 1+study-1 1/3, W/D, close to NASA, \$520 mo. x39541 or 480-2417.

Sale: Nassau Bay, 4-2.5-2, FPL, new paint, updated kitchen, spa on raised deck w/view of lake, playhouse, trees, landscaped, close to NASA, \$126.9k. 335-1378.

Lease: Nassau Bay townhouse, 4-2-2, 2000 sq ft, lg garage, deck atrium, non-smoker. Jerry, x38922 or 488-5307.

Sale: Sagemeadow, 4-2-2, 2140 sq ft, FPL, formals, den, fans, new A/C & H/roof/kitchen/appliances/garage doors, \$88.9k. Kornet, x48187 or 481-1531.

Rent: Lake Livingston lakefront home in exclusive subdivision, 2-2, sleeps 6, furnished, fishing/boating, near Onalaska, \$115/daily or \$600/weekly. 335-1378.

Rent: Lake Travis cabin, private boat dock, central A/C & H, furn, sleeps 8, summer/fall, \$650/\$550 weekly & \$120 daily. 474-4922.

Rent: Beach house, Jamaica Beach on West Galveston, 2nd row beach, amenities, sleeps 7, weekend/weekly rates. 488-6796 or 409-737-5017.

Rent: Arkansas cottage in the woods overlooking Blue Mt Lake & Mount Magazine, furnished, FPL, \$50/dly or \$250 w/ky. Corcoran, x47806 or 334-7531.

Rent: Galveston Beach house, Bay View, 3-2, sleeps 8, canal lot, all amenities, fisherman's paradise/wife's oasis, weekend/weekly rates, no pets. 488-4412.

Cars & Trucks

'91 Olds Cutlass Ciera, V6, 4 dr sedan, ex cond, 68k mi, A/C, AM/FM/cass, auto, power pack, cruise, \$6k obo. x31695 or 532-1089.

'93 Ford Ranger Supercab XLT, 4.0 6 cylinder, 5 spd, towing package, 2-tone red/tan, ex cond, \$10k. David, x36027.

'90 Pontiac Sunbird convertible, loaded, white w/black top, great cond, \$5.9k. David, x36027.

'79 Chevrolet El Camino, good to fair shape, \$2k obo. Jimmy, 337-5583.

'82 Pontiac J2000, good cond, good work car, \$800 obo. x47326 or 486-9673.

'91 Chevy Suburban Silverado, low mileage, clean, \$21.5k. Carlos, x38875 or 332-1991.

'89 Ford Probe GT Turbo, 5 spd, loaded, alarm,

great cond, \$5k. Tiffany, x31888 or 643-2210.

'86 Chevy C-10 pickup, 8' Gem top cover, 305 V8, 92k mi, 1 owner, A/C, \$3.2k. Ed, 471-2542.

'84 Olds Ciera cruiser wagon, very good cond, A/C, P/W & P/S, P/B, auto, loaded, \$1.7k. x36309 or 474-9747.

'88 Ford F150 pickup, std, good work truck, 71k mi, \$3,995. Ken, x34259 or 332-4886.

'89 Pontiac Lemans, 2 dr, A/C, AM/FM/cass, 5 spd, looks/runs great, \$2k. Joe, x38851 or 488-1750.

'82 Mazda RX-7, silver/black, 5 spd, AM/FM/cass, good cond, \$2k. 488-9080 x3204 or 486-0253.

'90 Dodge Grand Caravan SE, A/C, P/W & P/L, tilt, 80k mi, looks/runs good, \$5.5k. 333-6188.

'87 Saab 9000S, 85k mi, silver w/gray inter, auto, 5 dr, sunroof, loaded, garaged, \$3.4k. 286-5431.

'84 BMW 318i, 5 spd, sunroof, good cond, 4 cylinder. 991-0821.

'90 Eagle Talon TSI AWD turbo, 5 spd, factory warranty, ex cond, \$7k. 532-1058.

'90 Ford Aerostar XLT, extended length, ex cond, 120k mi, 1 owner, \$5.5k. 332-2229.

'76 BMW 2002, green/tan, engine disassembled, good parts car or restoration project obo. Marty, x40268 or 332-9783.

'85 4X4 Toyota SR-5 sports truck, rollbar w/lights, AM/FM/cass, sunroof, big tires, \$3,450. 326-5686.

Boats & Planes

'92 Kawasaki 750 waverunner, trailer, life vests, \$3.5 obo. x32264 or 488-2184.

Hyperlite wakeboard w/bag, ex cond, \$80. Phil, 333-6372 or 332-2150.

Cycles

'93 Suzuki RM250, FMF pipe, never raced, \$2.3k. x32156 or 332-2357.

Audio Visual & Computers

DX2-66 & DX4-100, 9Mb/850Mb mini-tower, 14" monitor, \$695/\$775; Pentium 75/100/133/166, 8Mb/ 850Mb, 14" monitor, all have Win 3.11 or Win95, Office, other software, \$899, \$969, \$1,099, \$1,299. Don, 333-1751.

Mac II ci 8/230 w/SuperMac 8 bit graphics card, SuperMac 19" monitor & Practical peripherals 14.4 external modem. \$1k obo. Jim, 244-5068.

Macintosh Performa 405, included S/W package, 14" color monitor, kybd, mouse, modem, software package, \$550; 730Mb extended HD for Mac, \$300; 14.4 external fax/modem for Mac, \$70. 326-5184.

Sony car Discman w/remote & ESP, \$100. Thang, x31464.

Personal electronic printer (electric typewriter), Brother EP-41, new \$168 sell \$40. Lonnie, x35807 or 333-5207.

Coustic Power Logic car stereo amplifier Amp 260, 45W RMS/channel; 125W RMS, Bridget Mono, \$50; Linear Power 95W car stereo amplifier, \$35; Carver Tx-Nine cassette deck, needs repair, \$20. Lonnie, x35807 or 333-5207.

Gateway Nomad 486/DX50/8Mb RAM/210Mb HD portable computer, \$350 obo. Stuart, x41179 or 486-7996.

Power Mac 6100 w/DOS Card, 16Mb RAM, 700 Mb HD, CD ROM, system 7.5, CPU only, \$995 or full system, \$1,295. 244-2444 or 488-4382.

AT&T cordless phone, 2 line, \$40; Mac Global Village 2400 modem, \$20. Bob, x33149.

Today

Reservations due: The Houston Forum will host a luncheon at 11:30 a.m. July 10 at the J. W. Marriot Hotel. Ed Weiler, pioneer for NASA's Hubble Telescope Project will discuss "Back to the Future - Exploring the Frontiers of Time and Space with the Hubble Telescope." Cost is \$25 for members, \$30 for guests. Reservations are due July 5. For more information, call 439-0466.

Cafeteria menu: Special: tuna noodle casserole. Total Health: broiled chicken breast. Entrees: deviled crabs, broiled pollock, liver and onions, broiled chicken with peach half, Reuben sandwich. Soup: seafood gumbo. Vegetables: Italian green beans, cauliflower au gratin, steamed rice, vegetable sticks.

Monday

Cafeteria menu: Special: Italian outlet. Total Health: herb flavored steamed pollock. Entrees: barbeque beef spare ribs, steamed pollock, baked chicken. French dip sandwich. Soup: black bean and rice. Vegetables: California mix, okra and tomatoes, vegetable sticks, ranch style beans.

Tuesday

Cafeteria menu: Special: spaghetti with meatballs. Total Health: baked potato. Entrees: stir fry beef, liver and onions, beef cannelloni, ham steak French dip sandwich. Soup: split pea. Vegetables: winter blend mix, seasoned cabbage, breaded squash, lima beans.

Wednesday

Toastmasters meet: The Spaceland Toastmasters will meet

at 7 a.m. July 10 at the House of Prayer Lutheran Church. For more information call Jeannette Kirinich x45752.

MAES meets: The Society of Mexican American Engineers and Scientists will meet at 11:30 a.m. July 10 in the Bldg. 3 Cafeteria executive dining room. For more information call Michael Ruiz at x38169.

Astronomy seminar: The JSC Astronomy Seminar will meet at noon July 10 in Bldg. 31, Rm. 129. An open discussion meeting is planned. For more information, call Al Jackson at x35037.

PSI meets: The Clear Lake/NASA Chapter of Professional Secretaries International will meet at 5:30 p.m. July 10 at the Holiday Inn on NASA Road 1. Mary Heartline will discuss on "How to Make a Statement Without Saying a Word." For more information, call Juanita Woodfox at 286-3346.

Cafeteria menu: Special: smoked barbecue link. Total Health: roast porkloin. Entrees: cheese enchiladas, roast pork and dressing, baked chicken, steamed pollock, Reuben sandwich. Soup: seafood gumbo. Vegetables: Italian green beans, Spanish rice, turnip greens, peas and carrots.

Thursday

Radio Club meets: The JSC Amateur Radio Club will meet at noon July 11 in Bldg. 16 Rm. 253. For more information call Larry Dietrich at x39198.

Airplane club meets: The Radio Control Airplane Club will meet at 7:30 p.m. July 11 at the Clear Lake Park Community Bldg. For more information call Bill Langdoc at x35970.

Cafeteria menu: Special: chick-

en fried steak. Total Health: roast beef with gravy. Entrees: steamed pollock, lasagna with meat, steamed pollock, catfish, French dip sandwich. Soup: cream of turkey. Vegetables: whole green beans, butter squash, cut corn, black-eyed peas.

Friday

Astronomers meet: The JSC Astronomical Society will meet at 7:30 p.m. July 12 at the Lunar & Planetary Institute 3600 Bay Area Blvd. For more information call Chuck Shaw at x35416.

Cafeteria menu: Special: fried chicken. Total Health: vegetable lasagna. Entrees: pollock hollandaise, beef stroganoff, vegetable lasagna. Vegetables: steamed broccoli, carrots vichy, Italian zucchini, breaded okra.

July 13

EAA dance: The Employee Activities Association will host a Variety Dinner/Dance at 7:30 p.m. July 13 at the Gilruth Center. Tickets are on sale through July 10, cost \$22 per person and includes bands, dinner, and six beverage coupons. For more information contact Mavis Ikenhans at x49644.

July 20

Loral Lunar Rendezvous Run: The 18th annual Loral Lunar Rendezvous Run will be held from 7:15-9 a.m. July 20 at the Gilruth Center. Entry fee is \$13 before July 13 and \$18 after July 13 and race day. The run will consist of a 5K race and a 5K walk. Applications are available at the Gilruth Recreation Center. For information, contact Willie Vanderbrink, at 470-6715.

chair, nice paisley print, rust/gray/white/lt gold, very good cond, \$350 both. Arlene, 488-6156.

Formal, maple, colonial dining table w/6 chairs 7 2 leaves, \$500; hutch/dresser, \$300; 4 TV trays, medium dark wood, \$35; lg square coffee tables, \$30 each; end tables, \$30; 2 8' horizontal blinds, \$85. 282-3570 or 474-3820.

2 beige sofas, ex cond, \$200 each/\$350 both. 486-5843.

White bathroom cabinet, 28" wide w/matching white sink, 31" wide, \$40 obo. x31057.

Student desk, solid maple wood w/drawer & shelves, \$50; 2 antique oak step tables, ex cond, \$150 both; oriental style coffee table, extra thick imported glass top, #450; love seat, 2 cushion, ex cond, \$350. 488-5566.

Broyhill bedroom set, oak veneer, queen headboard, 9 drawer dresser, 6 drawer chest, 2 drawer nightstand, 2 each, ex cond, \$750. 488-9080 x3204 or 486-0253.

Double wall oven, almond color, has 1 upper element out, will assist buyer in replacing, 4100. 488-5922.

Appliances, W/D (TOL); refrigerator w/icemaker 21.2 cu ft, 6 mos, \$1.2k. 488-4331.

King size mattress & springs, good cond, 50. 244-0250.

Want Ads

Want used clarinet Buffet E110r Normandy for 1st yr student. Joewa, x30284.

Wanted space shuttle payload & experiment decal's, pins, cloth patches from STS-75, STS-76, STS-77. Andrew, x34312.

Want a 3'x6' piece of smoked glass for a dinner table. x30941 or 409-935-2180.

Want low priced school/work car or truck, prefer Japanese. 271-7011.

Want Glock high capacity mags for Glock 22 or 23. x47601.

Want baby crib prefer wood, w/mattress. 996-0152.

Want bellbottom blue jeans. Chris, 482-0874.

Want your non-working mower or edger. x31883.

Want space memorabilia for private collection, flown items, e.g. utensils, clothing, autographs on photos, covers, letters, relating to Mercury, Gemini, Apollo, Skylab, Shuttle. Richard, 481-8080.

Want personnel to join VPSI vanpool departing Meyerland Park & Ride at 7:05 am for JSC, vanpool consists of on-site personnel working 8 am - 4:30 pm shift. Don Pipkins, x35346.

Want personnel to join VPSI Vanpool, departing South Braeswood Park & Ride lot at 6:50 a.m. for JSC & offsite locations, 7:30 - 4:30 shift. Susan Gaynor, 282-5447 or Al Ruder, x34997.

Miscellaneous

Home gym, BMI Challenger II, 17 exercises, ex cond, \$175. Ted, x36894.

Pear shaped diamond cluster dinner ring, 7/8 ct t/w, 14k set, new \$550 sell \$395. x31033.

Bauer skates, size 8, \$35; small oval dining table, \$50; waterbed heater, \$15; Brinkman smoker, \$20; bed mat for Chevy truck, \$50; radar detector, \$25; rear view mirrors for Chevy truck \$40; Rock-Shux mag-21, \$125. 998-2293.

Murray boy's 20' bike, ex cond, \$30. 337-2022.

Genuine freshwater pearl necklace & bracelet set, necklace 18"/bracelet 7", \$7.50 set. Sonia, 486-0389.

Radio, Ford F150 '87, \$10. x30737.

Marquis diamond ring, .5kt, size 4.5. Cindy, 639-0251.

Go-cart, 2 seater, 4Hp, running, fair cond, \$225. 471-9399.

Drafting table, 36"x60", lamp & chair, \$75. Jim, x31678 or 480-2454.

Front & rear chrome Toyota 4WD bumpers, front fits model year '92 - '95 & rear bumper fits '89 - '95, \$320. Don, x39501 or 286-4881.

Hot tub/spa, 4 person, 6' round, redwood surround, ex cond, \$900. x31025.

Complete ready-to-fly R/C biplane w/20 size engine & radio, \$215; large wood/iron fruit press, \$250; 30 gallon fish tank, filter, & stand, \$100; Postscript printer w/2 Meg memory, \$1.2k; B/W video camera, \$75; large plastic garbage cans, \$10. 282-3570 or 474-3820.

Milwaukee professional cordless 9.6V drill/driver, w/battery, charger & case, \$50; baby crib & mattress, \$75; 2 violins w/hard cases, \$25 each. Howard, x37346.

Bookcases, shelves, clothes, king-sized bed, couches, love seats, tools, 55 gal aquarium, edger, lawn mower, outdoor motor, table chairs, books. Bill, 482-6187.

Battery, 12V, Interstate, for Harley FL, FLH, can be used for many applications, \$25 obo. 538-1149.

Rossi .38 caliber revolver, includes locking case, \$150. x31057.

White beaded victorian wedding dress, size 7, veil, fitted v-back w/drop pearls & long bustled train w/cutouts, very beautiful, \$475. Leah, x34544 or 326-3759.

Vacation package for 2 that includes 2 nights in Ft. Lauderdale, roundtrip cruise w/meals provided to Bahamas, 2 nights in Bahamas, 2 nights in Orlando, and a rental car for Florida stay, your choice of dates, \$498. Liz, 244-1756 or 925-0034.

Handgun, Mauser 9mm, model 90 double action semi-automatic w/de-cocker, 2 14round magazines, blue finish w/hard wood grips, very good condition, \$450. Jim, 991-0533.

Challenging Chamber

JSC volunteers pave way for self-sufficient future space outposts

By James Hartsfield

Four JSC volunteers have spent more than three weeks, 24 hours a day, sealed in a converted vacuum chamber in Bldg. 7, continually recycling a week's worth of air and water to test technology that may one day become a cornerstone of human survival beyond Earth orbit.

The test is the second phase of the Advanced Life Support Program's Early Human Testing Initiative. Mechanical and chemical means are being used to recycle all air and water, including urine, for the four people in the chamber. The current test is planned to last 30 days. It follows a two-week, one-person test conducted in August 1995 that used a crop of wheat plants to recycle the test subject's breathing air.

"This test expands on last year's investigation extensively, studying totally different technologies—physicochemical rather than biological—on a scale more than four times greater," said Don Henninger, chief scientist for regenerative life support systems. "Regenerable life support is a critical enabling technology for the future of humans in space. Without it, trips to Mars or to the Moon to establish bases are simply impossible. You just cannot carry all of the supplies needed for such voyages without recycling."

Test Crew Leader Doug Ming, 40, a space scientist; John Lewis, 29, a lead engineer for the project; Pat O'Rear, 29, a lead electrical engineer on the project; and Katy Hurlbert, 31, an aerospace engineer and spacecraft thermal systems expert, have been living inside the three-story, 20-foot diameter chamber since June 12 and plan to remain there until July 12.

The chamber has no windows to speak of, although on the third floor each person has a closet-sized individual bedroom that includes a small desk and computer, complete with an attachment to cable television. The entire first floor of the chamber is the combination living room, dining room, kitchen, laundry room, bathroom and water recycling equipment. The second floor holds much of the equipment that is continuously recycling the chamber air.

But life inside of the "Can," as the chamber has become somewhat affectionately called by those involved, is not bad, crew members said recently.

"I have been really impressed with it so far," Lewis said. "And I have been really pleased with the performance of the systems. Based on what we knew coming in, I thought we were going to have more problems than we've actually had. I was expecting more of a noticeable odor in this chamber, but it is such a large chamber, you don't really notice any. As for the water, it tastes good and we turn it into Kool-Aid as well and drink it that way. It tastes fine."

"I guess one of the reasons we haven't hit the boredom level is because we have yet to have a typical day in here," O'Rear added. "Every day we have had so far has been completely different. The time has actually flown by. It's kind of hard to keep track of the days, because the time has gone by so quickly. At this point, I am actually kind of disappointed that it is only going to be 30 days. I kind of wish there were going to be a few more."

The crew members' motivation for taking part in the test runs along a common theme—paving the way toward the future in space. "I truly believe that this is a stepping stone to a first lunar outpost," Ming said. "I think everything we develop from now on in this program will be the root of it all."

Hurlbert echoed those sentiments, and said she finds motivation daily to remind her why she is taking part. "I asked to have a picture of the Mars surface in front of the treadmill, and now, when I am running every morning, I find

myself daydreaming that years from now we may be beginning to work on an outpost there," she explained. "Those dreams really motivate me to run harder, run faster and try to get us there as soon as possible."

For the two engineers in the crew, motivation comes from different sources as well, Lewis added. "When Pat and I are working on the systems to maintain or repair them, it really justifies our being here, and I'm glad I'm the one who gets to be in here," he said. "Since I was deeply involved in the design of these systems, volunteering for this test was sort of like putting my money where my mouth is."

The four crew members and four alternate crew members were chosen from a field of more than 40 people who volunteered from among those who work with life support systems development at JSC.

"I was surprised by the response," Henninger said. "It is a lot of work, and all of those who volunteered knew just what it entailed."

A total of about 60 people work with the Advanced Life Support Program at JSC, and the program is supported by researchers at Kennedy Space Center, Ames Research Center and NASA's Jet Propulsion Laboratory, as well as university and industrial researchers. All of those involved share a deep commitment to the work, Henninger said.

Since an average astronaut would use about 22,000 pounds of water and 730 pounds of oxygen in a year, recycling these and other consumables is a necessity for long stays in space. In the Phase 2 test, air is recycled by removing and concentrating the carbon dioxide from the chamber. Hydrogen is combined with the carbon dioxide to create water, methane and other trace gases. The methane and other gases are disposed of, and electrolysis is used to split the water into oxygen and hydrogen. The oxygen is put back into the chamber and the hydrogen is used to recycle carbon dioxide.

Shower water, other personal hygiene water, and laundry water are recycled using an ultra-filtration/reverse osmosis system. Urine is processed separately by distillation. The resulting water is tested to meet far more stringent standards than are in place for municipal tap water and then is reused.

Without recycling, the air and water in the test would have lasted less than a week. Although the physicochemical systems used in this test are working well, the actual life support systems used in space in the future will likely consist of both plants and physicochemical processes, Henninger said. Plants and physicochemical systems such as are being tested now will both be a part of a Phase III 90-day, four-person test targeted for 1997. Beyond the Early Human Testing Initiative, future tests in a new Human Rated Test Facility will simulate a true spacecraft or base as closely as possible, with not only air, water and solid waste recycled, but also a self-sufficient food supply from plants. All machinery would be housed inside of the HRTF modules as well, just as would be the case in space.

"The goal of this testing is to identify areas where research is needed, look at the performance of a combination of hardware and to prove this technology is compatible with humans," he explained.

"The people working on this program feel like what they are doing will become a part of history. We will leave Earth orbit again one day, and we will have outposts on the Moon and Mars," Henninger said. "Every one of them will tell you that it is going to happen—the only question is when. And everyone is excited that they will have been a part of it when it does." □



From left to right, top to bottom; 1) Test crew members for the 30-day recyclable life support test now under way in Bldg. 7 include, from left, Katy Hurlbert, Doug Ming, John Lewis and Pat O'Rear. 2) From left David Staat, Stephanie Ayers, Nigel Packham, Russ Bachtel and Burt Laws monitor the test chamber to ensure the volunteers safety. 3) Hurlbert and Ming take an air sample inside the chamber. 4) Ming sorts through sample bottles inside the chamber. Water and air samples are taken several times daily as part of the test procedure, as well as swabs from the nose and throat of the test crew members. 5) Hurlbert and Ming prepare a meal inside the Bldg. 7 test chamber.

Hubble's deep field images finds distant galaxies

Astronomers analyzing the Hubble Deep Field—the faintest view of the universe taken with NASA's Hubble Space Telescope—have identified what may prove to be the most distant objects observed to date.

Scattered among the nearly 2,000 galaxies in the Hubble images, that were taken last December, researchers and collaborators found several dozen galaxies they believe exhibit characteristics which make them appear to be more distant than any seen previously. Six of the galaxies appear to be more distant than the farthest quasars, the current distance record holders.

The candidate galaxies are so far away they may have existed when the universe was less than five percent its present age. If this early galaxy population can be confirmed through further observations, it means that

such galaxies would have formed remarkably early in the history of the universe, only a few hundred million years after the Big Bang. The images also give an estimate of how many galaxies were forming at this time in the very early universe.

In one of the first studies of the statistical properties of these distant galaxies, Kenneth Lanzetta and Amos Yahil, of State University of New York and Alberto Fernandez-Soto, of the University of Cantabria in Spain, have attempted to determine the distance of the galaxies based on their colors.

"Since light travels at a finite speed, the galaxies are seen as they were in the distant past, allowing us to study the birth and growth of galaxies versus time," said Lanzetta. "Our results have implications bearing not only on the formation and evolution of galaxies but

also on the ultimate fate of the universe," adds Yahil.

The team's distance estimates rely on the relationship between speed and distance in the expanding universe. The expansion of the universe causes the light from distant galaxies to be "redshifted." This means that light which leaves a distant galaxy as blue arrives at Hubble as red because of the expansion of space. For a nearby galaxy the shift from blue to red is relatively small, but for a distant galaxy the shift is dramatic, because the light is crossing a larger volume of space.

The researchers took the colors of different kinds of nearby galaxies and redshifted them on a computer to compare with the colors of galaxies observed by Hubble. For each galaxy they assigned a "most probable" redshift based on the best match to the "spectral

templates" they developed.

While the procedure is not definitive for any individual galaxy, the authors contend that it is correct for the majority of galaxies and gives a good overall view of the distribution of distances of the galaxies seen in the Hubble image. If the redshifts are correct, then the light from these galaxies was emitted when the universe was far less than one billion years old.

Hubble spent ten days in December 1995 observing a single tiny patch of sky. These observations resulted in the deepest image of the sky, revealing galaxies fainter than had ever been seen before. The striking full-color image of the distant universe was unveiled at the American Astronomical Society Meeting in January 1996, and for the last six months has been the subject of intense study worldwide.

Langley boss to retire soon

Paul Holloway has announced he is stepping down as director of NASA's Langley Research Center no later than early October 1996.

Holloway said he is leaving to allow the appointment of a director who could make a longer-term commitment to steering Langley through the challenges facing the agency for the rest of the decade.

"This is the lull before the November election, and after that Langley is going to need the services of a center director who is willing to stick around for a while," said Holloway, a Langley employee since June 1960. "Everyone knows I have been considering leaving within the next two or three years, and this is a good time to do it."

"Paul Holloway will be missed," said NASA Administrator Daniel S. Goldin. "His career spans almost the entire history of the space age, and his many achievements at Langley are a tribute to his talent, his professionalism and his dedication to the importance of NASA aeronautical programs. We wish him all the best in the future."

Holloway said stepping down is not easy. "This has been my life for so many years, and I have made many friends. But I am confident that the wonderful people of Langley will carry on the reputation of this center as a world-class facility."



In the Space Station Processing Facility at Kennedy Space Center, engineers install an experiment rack in a specially designed Spacehab adapter. The Active Rack Isolation System Experiment is designed to dampen vibration disturbances that could interfere with microgravity experiments in the Spacehab module on STS-79. The ARIS rack will provide a microgravity research environment free from the disturbances typically created by spacecraft hardware. The Spacehab will be installed into *Atlantis'* payload bay at Launch Pad 39A Tuesday.

Crew repairs bubble drop unit

(Continued from Page 1)

the Earth smaller for all its inhabitants is the Olympics. We are honored on this mission to be flying a banner celebrating the 1996 Olympics in Atlanta."

Both *Mir* and *Columbia* were greeted by the executive director of the 1996 Olympics Bill Payne.

"We are very proud that you have taken our Olympic torch into space with you traveling some five and a half million miles," Payne said. "When you return to Cape Canaveral, that will be the day the Olympic torch relay reaches Cape Canaveral. We will have the great honor of joining the torch you carry with you on this mission with the Olympic flame and recording for all history the fact that this torch relay demonstrated cooperation among so many countries of the world."

Meanwhile, investigations continue with the crew adjusting its sleep

schedule to accommodate an early wake up call on landing day and to investigate circadian rhythms and the crew's duty performance.

"We are sleep shifting 25 minutes earlier each day," Henricks said in an interview Tuesday. "Those minor changes in our wake-up time should not affect performance and that is what we are measuring. Once we return to Earth we can see if we are successful in controlling circadian rhythms even though we are not exposed to a typical day night cycle. It will be very beneficial to folks that work changing shifts on Earth."

The crew completed the last in a series of Torso Rotation Experiments on Monday. Linnehan and Thirsk wore torso and head sensors that measure eye, head and body coordination. Researchers will analyze this test with others taken earlier to determine the effects of long duration weightlessness.

Muscle strength measurement experiments continue on the Torque Velocity Dynamometer. "With this information we can figure better ways to keep people in space healthier and fight off muscle and bone degeneration," Linnehan said.

Other experiments are going well as the crew repaired the Bubble Drop and Particle Unit last week. Power was rerouted to one of the test containers, bypassing a circuit which had been causing an intermittent short. On Monday, Favier and Brady melted a solid tetracosane sample to study the separation process and help prevent flaws in glass and crystal as they solidify. Over the weekend, Kregel praised a video-conferencing system being tested on *Columbia*. "The video conferencing has really been outstanding," Kregel said. "We used it to fix the Bubble, Drop and Particle Unit experiment, and it made fixes a lot easier."

Discovery returns to Florida

(Continued from Page 1)

Monday, and the Spacehab double module will be installed in the payload bay Tuesday.

Readdy, Blaha, Pilot Terry Wilcutt, and Mission Specialists Tom Akers, Jay Apt and Carl Walz, will participate in a final countdown rehearsal July 18 and 19, as the payload bay doors are closed for flight.

Meanwhile, *Discovery* completed its ferry flight from California to Florida this week following maintenance and refurbishing at Rockwell International's factory in Palmdale, Calif. As part of that work, equipment necessary for *Mir* dockings was installed in the orbiter.

However, *Discovery's* first flight

upon returning to the fleet will be the second Hubble Space Telescope Servicing mission, scheduled for launch Feb. 13, 1997.

Removal of the ferry tail cone and initial power-up in the Orbiter Processing Facility are scheduled for Tuesday. *Discovery's* payload bay doors will be opened July 16.

With *Discovery* back in the launch rotation, *Endeavour* begins eight months of major modifications and structural inspections at Palmdale. Delivery to California is planned for the first week of August. Once *Endeavour* returns to KSC, its next mission will be the first International Space Station assembly shuttle flight, in late 1997.

JSC employees, contractors to be honored next week

NASA astronauts are among the employees who will receive the agency's highest honors in a ceremony to be held at 3 p.m. Tuesday in the Teague Auditorium.

This year's ceremony will honor individuals and groups nominated by center management and selected by the Incentive Awards Board at NASA Headquarters to receive NASA's highest honorary awards.

Each recipient of a NASA medal will also be presented with a framed certificate signed by NASA Administrator Daniel S. Goldin. Individuals selected to receive Group Achievement Awards on their team's behalf

will receive a framed certificate. Certificates for individual participants of teams will be forwarded to the nominating organizations at a later date. NASA's Deputy Director John Dailey and JSC's Deputy Administrator James Wetherbee, will assist JSC Director George Abbey in presenting the awards.

Following the ceremony, a reception will be held in the lobby of the auditorium for award recipients and their guests. Supervisors are encouraged to allow employees to attend as their workloads permit. For details about the ceremony, contact Helen Harris at x38413.

EAA hosts variety dinner dance

The Employee Activities Association will host a Variety Dinner and Dance at 7:30 p.m. July 13 in the Gilruth Center.

The dance will feature the Aubrey Tucker Orchestra in the ballroom and the Southern Cross band in the

gym. Tickets are on sale through Wednesday and cost \$22 per person including dinner and beverage coupons. Dinner includes chopped sirloin, carrots, new potatoes, salad and dessert. For more information call Mavis Ilkenhans at x49644.

JSC takes home bronze

(Continued from Page 1)

"On the Cutting Edge: ISS" won in the Television or Cable Program for Children category. This live educational teleconference from the Bldg. 9A space station mock-up was jointly developed by Oklahoma State University "Teaching from Space" educational producer Camille Moody and Taft producers Pat Lowry and Florence Newman. The program featured live interaction between several astronauts and students in the facility as well as students participating remotely via computer hook-ups and telephone call-ins. During the event, students learned about the International Space Station and the mission it will perform over the coming years. Taft carried out the monumental logistical task of stag-

ing and broadcasting the event which was carried live, on the NASA Television satellite, to schools across the country and on NASA Television.

The Media Services Corp. received two Bronze Telly Awards for productions created for the Office of Public Affairs. The award winning productions are, "1995 Mission Highlights," a five minute music video produced by Denise Dicks and Glen Peterson showcasing the shuttle missions flown in 1995, and "The First Step," an eight and a half minute narrated piece produced by Craig Crowe and written by Denise Dicks recapping the successes of the International Space Station's phase one missions, beginning with STS-60 and ending with STS-76.

Students talk to Lucid on Mir

(Continued from Page 1)

CNN and CompuServe, Lucid answered questions ranging from the taste of food to the best way to get into the space program.

Food on board *Mir* was of interest for many of the students who asked questions like "How does the food taste?" and "What happens if you run out of food?" But Lucid assured them that food was not an issue.

"The food tastes really good. We have been up here for over three months and the food still tastes very good. We have a mixture of both Russian and American food on board. I don't think we're going to run out of food either. There's a lot here and, every six to eight weeks, a spacecraft brings us more food. The next shuttle will also bring food up. Eating is one of the things we really enjoy doing up here."

Other students wanted to know what Lucid thought was the best way to get in the space program, being in the military or being a scientist. "Either way," Lucid said. "The American space program is equally split. I have no military experience at

all. The key is to do what you really enjoy doing. If you like the military, that's the way to go. But either way is a good way to get into the program."

In addition to these interviews, Lucid and her crewmates continued with their work aboard the space station this week, working with an experiment similar to the work being done on *Columbia*.

The Candle Flame in Microgravity experiment focuses on studies of a candle flame in a weightless environment to try and gain additional insight into the complicated physiochemical process of combustion. Continuing Earth observations focused on the Texas/ Louisiana coast, Mexico City and the North East U.S. Urban Region.

Cosmonaut Researcher John Blaha finished his training activities in Star City and returned home this week after participating in a pre-flight press conference in Star City last Wednesday. He took the remainder of this week off, and will begin final preparations for his launch on STS-79 Monday. Blaha will replace Lucid on *Mir* in early August.

Space News Roundup

The Roundup is an official publication of the National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Texas, and is published every Friday by the Public Affairs Office for all space center employees.

Electronic mail messages should be sent to the editor, khumphri@gp301.jsc.nasa.gov or the managing editor, kschmidt@gp301.jsc.nasa.gov.
Editor Kelly Humphries
Managing Editor Karen Schmidt
Associate Editor Natasha Calder